

IN THE CLAIMS

What is claimed is:

- 1 1. A method of forming a microelectronic structure comprising;
2 forming a diamond layer on a substrate, wherein the diamond
3 layer comprises defects; and
4 forming pores in the diamond layer by removing a substantial
5 amount of the defects from the diamond layer.

- 1 2. The method of claim 1 wherein forming pores in the diamond layer
2 comprises reducing the dielectric constant of the diamond layer by forming
3 pores in the diamond layer.

- 1 3. The method of claim 1 wherein forming a diamond layer on a
2 substrate comprises forming a diamond layer on a substrate by chemical
3 vapor deposition.

- 1 4. The method of claim 1 wherein forming a diamond layer on a
2 substrate comprises exposing the substrate to a gas comprising a
3 hydrocarbon and hydrogen, wherein the hydrocarbon concentration is above
4 about 10 percent of the hydrogen concentration.

1 5. The method of claim 4 wherein exposing the substrate to a gas
2 comprising a hydrocarbon comprises exposing the substrate to a gas
3 comprising methane.

1 6. The method of claim 1 wherein forming a diamond layer on a
2 substrate comprises forming a diamond layer on a substrate wherein the
3 diamond layer comprises at least one of double bonds, vacancies or
4 interstitials.

1 7. The method of claim 1 wherein removing the defects from the
2 diamond layer comprises etching the defects from the diamond layer.

1 8. The method of claim 7 wherein etching the defects comprises
2 exposing the defects to oxygen gas at a temperature below about 450
3 degrees Celsius.

1 9. The method of claim 7 wherein etching the defects comprises
2 exposing the defects to oxygen gas and utilizing a rapid thermal anneal
3 process.

1 10. The method of claim 7 wherein etching the defects comprises
2 exposing the defects to at least one of a hydrogen plasma or an oxygen

3 plasma.

1 11. The method of claim 10 wherein exposing the defects to a hydrogen
2 plasma comprises reducing the coefficient of friction of a top surface of the
3 diamond layer by passivating the top surface of the diamond layer with
4 hydrogen.

1 12. The method of claim 1 wherein forming a diamond layer comprises
2 forming the diamond layer in a deposition chamber of a cluster tool.

1 13. The method of claim 1 wherein forming pores in the diamond layer
2 comprises forming pores in the diamond layer in an oxidation chamber of a
3 cluster tool.

1 14. The method of claim 1 further comprising:
2 forming a second diamond layer on the diamond layer in a deposition
3 chamber of a cluster tool: and
4 forming pores in the second diamond layer in an oxidation chamber of
5 the cluster tool.

1 15. A method of forming a microelectronic structure comprising:
2 forming a first diamond layer on a substrate, wherein the first

3 diamond layer comprises a mixture of sp² bonds and sp³ bonds; and
4 exposing the first diamond layer to a hydrogen plasma, wherein
5 the sp² bonds are substantially removed from a top portion of the first
6 diamond layer.

1 16. The method of claim 15 wherein forming a first diamond layer
2 comprises forming a first diamond layer by utilizing a plasma comprising a
3 concentration of methane that is above about 10 percent of a concentration
4 of hydrogen.

1 17. The method of claim 15 wherein exposing the first diamond layer to a
2 hydrogen plasma comprises converting the top portion of the first diamond
3 layer to form a substantially sp² free diamond layer by exposing the first
4 diamond layer to a hydrogen plasma.

1 18. The method of claim 15 further comprising forming a second diamond
2 layer disposed on the substantially sp² free diamond layer, wherein the
3 second diamond layer comprises a mixture of sp² and sp³ bonds, by utilizing
4 a plasma comprising a concentration of methane that is above about 10 % of
5 a concentration of hydrogen.

1 19. A structure comprising:

2 a diamond layer comprising a substantial amount of pores.

1 20. The structure of claim 19 wherein the diamond layer comprises a
2 dielectric constant below about 1.95.

1 21. The structure of claim 19 wherein the diamond layer comprises a
2 strength above about 6 GPa.

1 22. The structure of claim 19 wherein the diamond layer comprises an ILD
2 layer.

1 23. A structure comprising:
2 a diamond layer comprising a mixture of sp² bonds and sp³ bonds;
3 and
4 a substantially sp² free diamond layer disposed on the diamond layer,
5 wherein the substantially sp² free diamond layer comprises sp³ bonds.

1 24. The structure of claim 23 wherein the substantially sp² free diamond
2 layer does not comprise an appreciable amount of sp² bonds.

1 25. The structure of claim 23 wherein the structure comprises a dielectric
2 constant less than about 1.95, and a strength above about 6 GPa.

1 26. The structure of claim 23 wherein the structure comprises an
2 ILD layer.

1 27. A structure comprising:
2 a conductive layer disposed on a substrate; and
3 a diamond layer disposed on the conductive layer, wherein the
4 diamond layer comprises pores.

1 28. The structure of claim 27, wherein the diamond layer comprises an
2 ILD.

1 29. The structure of claim 27, wherein the diamond layer comprises a
2 dielectric constant lower than about 1.95.

1 30. The structure of claim 27, wherein the diamond layer comprises a
2 strength above about 6 GPa.

1 31. The structure of claim 27, wherein the diamond layer comprises a

2 polishing rate about 100 times greater than that of the conductive layer.